Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PUBLIC HEALTH REPORTS

VOL. 35 APRIL 23, 1920 No. 17

OZONE IN VENTILATION.

Some Abstracts[1] from the Literature on the Use of Ozone in Ventilation.

The Public Health Service is in receipt of correspondence from which it would appear that there is some interest in having collected references to the literature on the use of ozone in ventilation. For the information of persons interested in this subject, some abstracts from "Chemical Abstracts" are given below.

Ozone for ventilation: Powell, S. T., Metallurgical and Chemical Engineering, vol. 13, pp. 975–977, 1915.—Temperature and humidity have very little effect upon ozone production; the air velocity through the tubes has a direct bearing. High concentrations acting for long periods have great germicidal action, efficiency being reduced with reduction of concentration. Oxidizable odors may be completely removed. No detrimental effect of ozone on health was noticed.

An experiment with ozone as an adjunct to artificial ventilation: Feldner, A. M., Heating and Ventilating Magazine, March, 1915, pp. 35–36.—Ozone eliminated odors in hospital room containing patients who were being treated for gastro-enteritis.

The use of ozone for disinfection of air: Galli-Valerio, B., Centralblatt für Bakteriologie, Parasitenkunde und Infectionskrankheiten, Abt. 1, vol. 75, pp. 93–96, 1914.—Galli-Valerio gives results obtained by using O_3 to sterilize the air in a small room. The temperature was 15–16° C., and the humidity 60 to 15 per cent of saturation. Galli-Valerio exposed cultures of *B. coli* and *M. pyogenes albus* dried on pieces of glass for 5, 6, and 9 hours. No killing nor inhibition of the bacteria was obtained. The experiment was repeated and in each case the same results were obtained. This author warns against the use of ozonators to sterilize air in rooms.

Ozone an aid to factory ventilation: Greene, V. D., Engineering Magazine, vol. 49, p. 517, 1915.—A discussion of the subject, in which there are pointed out the advantages of ozone as an aid to ventilation and the possibility of still further extending its industrial uses.

Reports discredit ozone as room disinfectant and deodorizer: Steinmetz, C. P., Engineering Record, vol. 68, pp. 645–646; Journal of the

---

[1] From "Chemical Abstracts."

American Medical Association, Sept. 27, 1913.—Results of two investigations discredit claims of manufacturers.

The bactericidal, deodorizing, and physiologic properties of ozone: Jordan, E. O., Carlson, A. J., and Sawyer, W. A., Editorial, Journal of the American Medical Association, Sept. 27, 1913; Engineering News, vol. 70, pp. 1092, 1096–1098.—O_3 has no therapeutic value and is detrimental to living beings long before concentrations are reached which have any bactericidal or deodorizing value. Details of tests are given with methods of bacterial and odor studies.

Ozone: Buswell, A. M., Journal of Industrial and Engineering Chemistry, vol. 5, pp. 882–883. Editorial. *Idem.* Franklin, M. W. *Ibid.*, vol. 6, pp. 82–83.—A reply to Buswell.

An experiment with ozone in school ventilation: Bass, Frederick, American Journal of Public Health, vol. 3, pp. 1135–1137; *cf.* Chemical Abstracts, vol. 7, p. 2637.—Mental and physiological tests were made on a group of pupils receiving recirculated ozonized air, and comparisons made with a control. No appreciable differences were noted. Foul odors were not noticeable, but the odor of the ozone could be detected.

Ozone machines and public health: Franklin, M. W., Electrical World, vol. 63, p. 381; *cf.* Chemical Abstracts, vol. 8, p. 770.—O_3 is capable of destroying practically all species of disease germs when in the presence of moisture with sufficient duration of contact and when the O_3 is in adequate concentration. Concentrations suitable for ventilation result in a marked and consistent lessening in the atmospheric bacterial content. In no case, however, were the bacteria of any specific species experimented on, or was the exact amount of O_3 recorded. The results do not show complete sterilization. Experiments with moist and dried cultures show much less action on the latter than on the former, and experiments with various bacteria in H_2O show a greater susceptibility to O_3 on the parts of the disease germs than on those of nonpathogenic species. Therefore, it is probable that the tiny globules of mucus present the bacteria to the action of the O_3 in the air in their most vulnerable conditions, and that when coughed or sneezed into the air they should be among those first destroyed. O_3 when intelligently applied is a valuable aid to ventilation.

The value of ozone in ventilation: Franklin, M. W., Gesundheits-Ingenieur, vol. 37, pp. 455–458; *cf.* Chemical Abstracts, vol. 8, p. 770.—O_3 can be recommended in all cases where organic odors are formed. It not only covers them but also destroys them effectually. In concentrations in which respiration is not interfered with, O_3 does not prevent the development of air bacteria to any degree.

Hygiene and the use of ozone for ventilation: Czaplewski, Metallurgical and Chemical Engineering, vol. 12, pp. 254–258.—Experiments by various authors show that in air purification, O_3 does not materially destroy bacteria or dust particles, but it removes odors. Low concentrations are agreeable, but high concentrations cause irritation of respiratory passages and have serious effects upon men and animals. A standard method of determination of O_3 is desirable. O_3 treatment should never be regarded as a substitute for good ventilation.

The bactericidal, deodorizing, and physiological effect of ozone: Wooldridge, F. V., Engineering News, vol. 71, pp. 778–779.—As a result of seven years' experience with O_3 Wooldridge concludes that (1) the bactericidal effect on air is very slight, except in concentrations impossible for life of man; (2) organic and some inorganic odors are destroyed; (3) physiological action in high concentrations is injurious; (4) it is useful in treatment of disease by raising resistance, not by sterilizing germs.

The value of ozone in ventilation: Franklin, M. W., Gesundheits-Ingenieur, vol. 37, pp. 155–158; Heating and Ventilating Magazine, vol. 10, Nos. 10 and 11; Chemisches Zentralblatt, 1914, *1*, p. 1295; *cf.* Chemical Abstracts, vol. 8, p. 2017.—Ozonized air does not only disguise disagreeable odors of all kinds, but actually destroys odors such as originate from onions, garlic, and limburger cheese. Odors of putrefaction are likewise eliminated. Other odors eliminated are those from manure, skatole, butyric acid, and tobacco. The CO of the air is oxidized to CO_2, the H_2S to S and H_2O The S is further oxidized to H_2SO_4. As long as the concentrations are such as not to interfere with the vital function, the germicidal property is low. Results obtained in practice have been very satisfactory.

Ozone in ventilation: Olsen, J. C., and Ulrich, W. H., Journal of Industrial and Engineering Chemistry, vol. 6, pp. 619–623; Heating and Ventilating Magazine, 1914, pp. 15–19.—Experiments of Jordan and Carlson are not confirmed. Olsen and Ulrich show that O_3 reacts with H_2S, NH_3, etc., destroying odors, and that there are no reasons for assuming that O_3 is toxic in concentrations used in ventilation.

Air ozonization: Franklin, M. W., Journal of Industrial and Engineering Chemistry, vol. 6, pp. 850–855.—The subject is treated under three heads: (1) Ozone as an adjunct to ventilation; (2) Destruction of odors from industrial plants, such as glue factories, fertilizer plants, slaughterhouses, fish marts, etc.; (3) Adjunct to refrigeration in the practice of cold storage and food preservation.

The use of ozone in purifying air: Konrich, University of Berlin, Zeitschrift für Hygiene, vol. 73, pp. 443–482; Chemiker-Zeitung, vol. 37, p. 385.—O_3 in much higher concentration than it is to be found in the air has no effect upon dry bacteria or dust particles. It has a germicidal effect, however, upon moist bacteria. In sufficient quantity it is a poisonous gas, causing death of laboratory animals. Concentrations which cause death are not deodorizing. Men subjected to its influence in a special apparatus experienced sleepiness, irritation of the mucous membranes, and a burning sensation in the eyes, at a time when the O_3 concentration was not greatly higher than that of the atmosphere. The odor of the air developed by the breathing was not destroyed.

The improvement of the air in bathing establishments with ozone: Von Kupffer, L. A., Gesundheits-Ingenieur, vol. 36, pp. 300–303.—Kupffer finds that O_3 in a concentration of about 0.1 mg. per cubic meter of air has an invigorating and purifying effect. Foreign odors are eliminated.

The use of ozone in ventilation: Von Kupffer, L. A., Gesundheits-Ingenieur, vol. 36, pp. 605–615.—Certain odors are quickly destroyed by O_3. Ozone should be free from N oxides. Ozonization should not be resorted to without ventilation accompanying it. An ozonization plant requires little attention. Reports by different firms on the practical use of O_3 in deodorization are given. The results are favorable. A number of reports on the use of O_3 under normal conditions as an aid in ventilation are also favorable.

The use of ozone in ventilation from the hygienic standpoint: Czaplewski, Gesundheits-Ingenieur, vol. 36, pp. 565–586.—O_3 is an extremely active gas. It acts better in a moist than in a dry atmosphere. It reacts energetically only in high concentrations. O_3 in the air can not be relied upon to destroy bacteria on the walls of a room; neither does it destroy organic dust. Certain odors, however, are either diminished or eliminated altogether. In low concentrations O_3 appears to men as agreeable and invigorating and is entirely free from danger. In high concentrations it irritates the mucous membrane of the respiratory tract. The sensitiveness of people toward O_3 will vary. Care should be taken to employ only pure O_3 for ventilation purposes, and particularly to prevent the formation of N oxides. Two kinds of O_3 ventilation must be considered: (1) Ventilation with ozonized fresh air; (2) Ozonization of stagnant air. The first procedure is undoubtedly to be preferred. Ozonization of stagnant air is merely an emergency procedure and of very doubtful value. The concentration of O_3 should be low enough to avoid complaints about irritation. High concentration should only be employed in the absence of people or in rooms which are used for short periods only.

The use of ozone in ventilation: Schmitz, E., Chemiker-Zeitung, vol. 37, pp. 384–385; Konrich, *Ibid.*, p. 385.—A discussion.

Ventilation of railway tunnel by ozonated air: Anon., Electrical World, vol. 59, p. 626.—In the system of the Central London Railway, air is drawn through a continually moistened filter screen to remove dust, NH_3, SO_2, etc. The O_3 generator consists of 10 units, each comprising a thin mica plate with a sheet of metal gauze on each side. These are subjected to an alternating electromotive force of 5,000 volts, causing a large number of minute discharges, thus producing O_3. This is mixed with the main body of air and blown through ducts to outlets along the tunnel.

Increasing human efficiency by ozone: Radcliffe, W. H., Cassier's Magazine, vol. 41, p. 483.—An account of methods of ozonizing air for ventilation, and of some installations in practical use.

Present status of ozone with reference to air purification: Small, Ralph D., Journal of Industrial and Engineering Chemistry, vol. 2, pp. 534–537.—Ozone for air purification is made with generators which change direct to alternating current and then step up the voltage to 5,000–30,000, the higher figures being the more economical. If properly made, the apparatus does not produce appreciable amounts of NO. Modern machines require 40–250 watts per hour for operation. From 0.1 milligram to 2 milligrams per cubic meter is found to be the most suitable concentration for air purification.

Experiments in ozone ventilation: Erlandsen, A., and Schwarz, L., Staatliches Hygienisches Institut, Hamburg. Zeitschrift für Hygiene, vol. 67, pp. 391–428.—Ozone in concentration of 10–20 milligrams per cubic meter of air in the experimental chamber, was found to have no effect on the NH_3 content of the chamber. No nitrites or nitrates were formed, and traces of ozone were demonstrable 12 hours after the completion of the experiment. As tested by the sense of smell, small traces of NH_3 were masked by ozone in concentration of 20 milligrams per cubic meter. Similar results were obtained with H_2S. Various odorous constituents of human exhalations were also tested—trimethylamine, butyric acid, valeric acid, indole, skatole—and it was found that their odors were masked by ozone in greater or less amounts, without any demonstrable destruction of the substances themselves. Ozone was found to have no effect in clearing the atmosphere of a room filled with tobacco smoke, though the odor of tobacco, if faint, could be masked. The practical value of ozone as a method of ventilation seems to rest, therefore, not on any oxidizing and purifying property, but on its power of covering up offensive odors.

The action of ozone on air: Troy, M. O., Chemical Engineering, vol. 14, p. 321.—O_3 may well be used in the treatment of air for the destruction and removal of noxious odors, organisms, and emanations. Sixty liters of air containing 13 milligrams of ozone will disinfect 324 cubic meters of air; but in most cases it will depend on the condition of purity of the air. Experiments showed that germs failed to grow in air which contained 0.6 to 1 per cent ozone by volume, but for deep-seated germs about 5 per cent is needed.